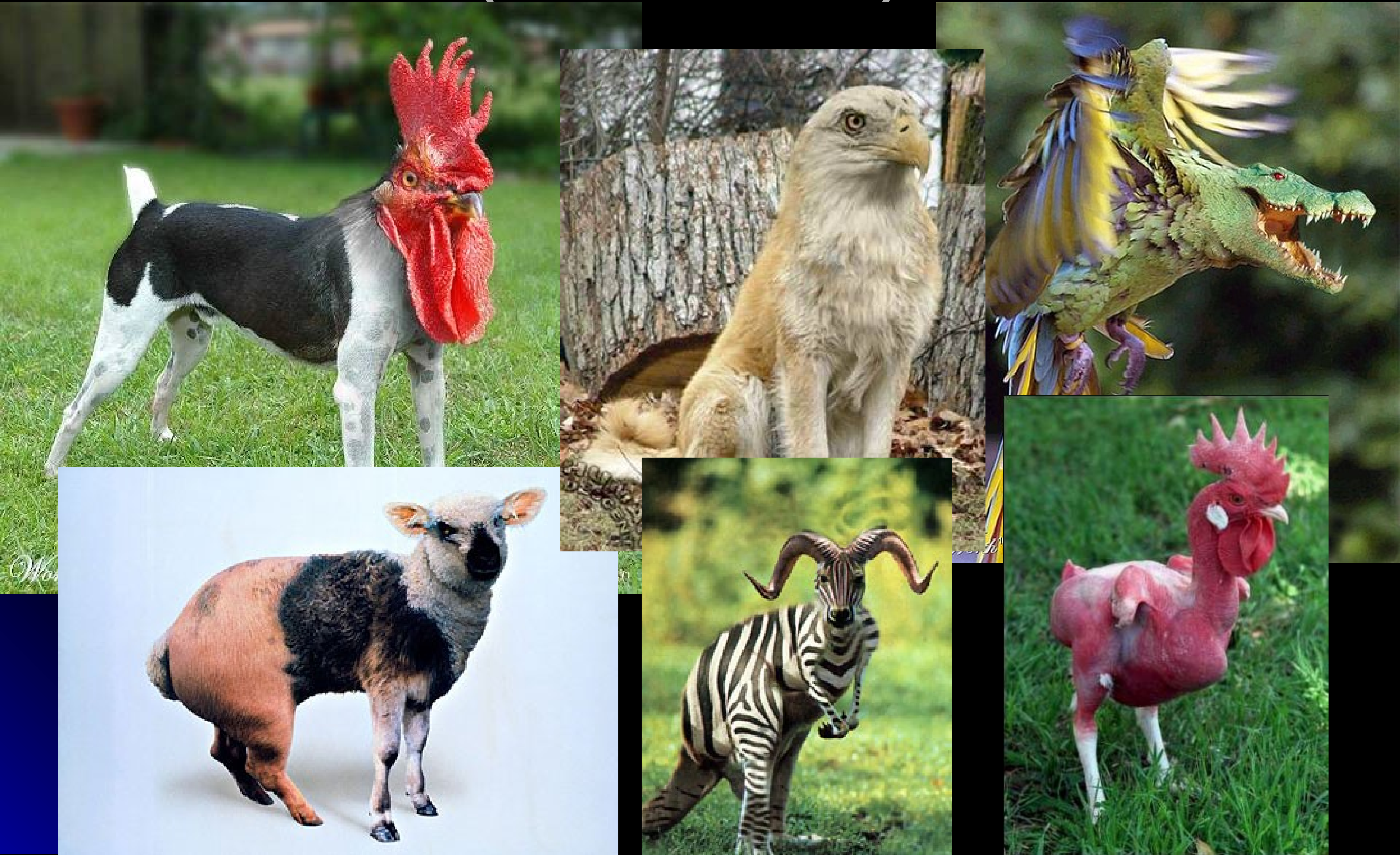
Genetic Engineering (Genetics)



Projects of Genetic Engineers

- Identification and treatment of certain types of diseases and illnesses (Gene Therapy)
- Genetic Finger Printing (Forensics)
- Genetically Modified Food (GMOs)
- Cloning
- Mapping of the Human Genome

Do you believe we humans are an alien genetic engineering project ?

Arthritis

Cystic Fibrosis

Sickle Cell Disease

Parkinson’s Diseas

Cancer (some Form

Stem Cell Resear

Color Blindness

AIDS ????

Gene therapy is the insertion of genes into an individual's cells and tissues to treat a disease

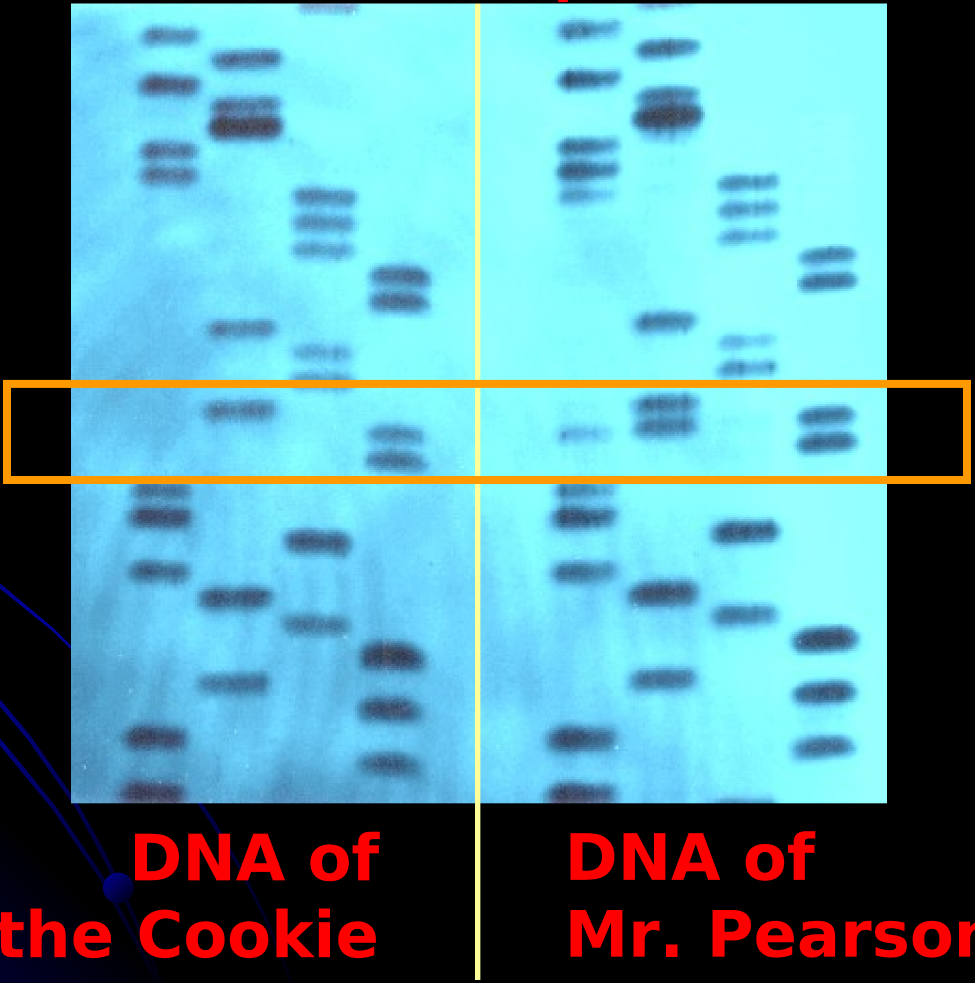
Identification and treatment of certain types of diseases and illnesses

- **Gene therapy** is the insertion of genes into an individual's cells and tissues to treat a disease, such as a hereditary disease in which a deleterious mutant allele is replaced with a functional one. Although controversial, Gene Therapy can also be used for human genetic enhancement changing ones genetic formula and function towards a desired goal of "enhancement". Although the technology is still in its infancy, it has been used with some success and scientific break throughs continue to move Gene Therapy towards mainstream medicine.

Genetic Finger Printing (Forensics)

Did Mr. Pearson steal the cookies?

Gel Electrophoresis

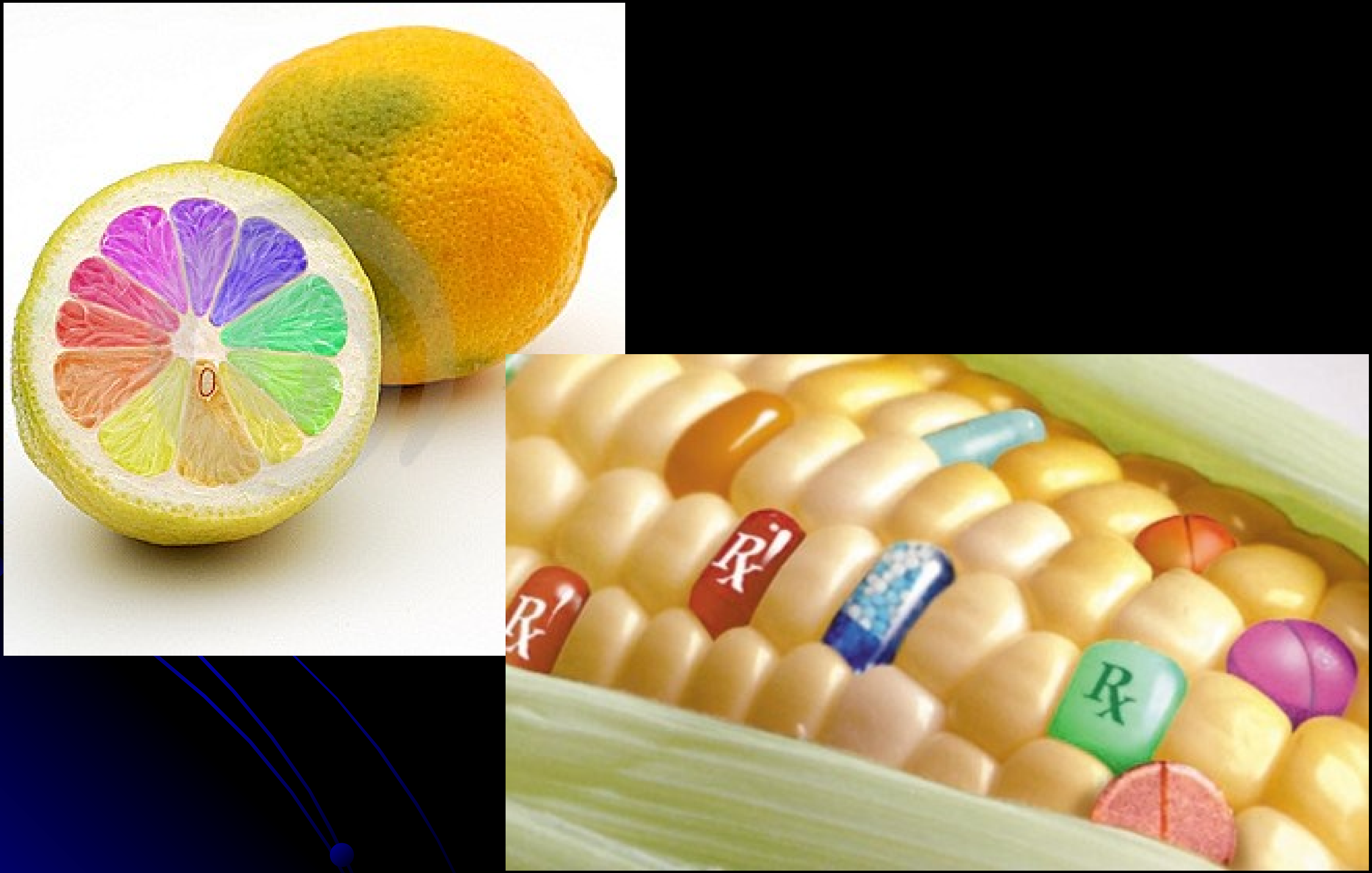


NO - the DNA is not a match. ☺

DNA of the Cookie Thief

DNA of Mr. Pearson

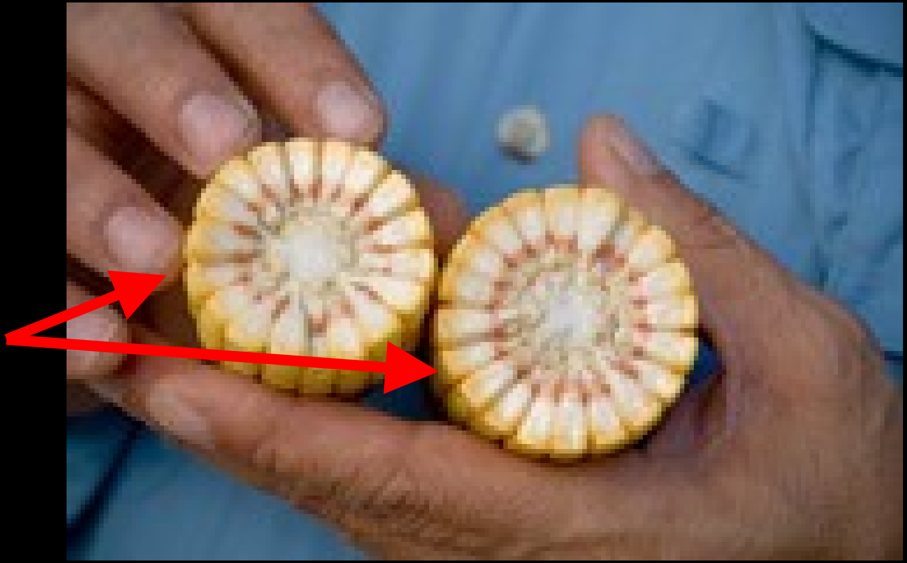
Genetically Modified Food

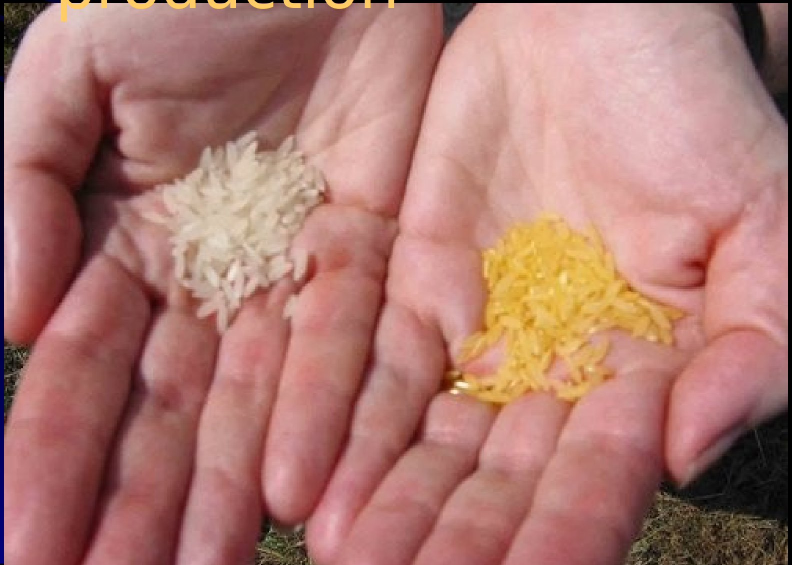


Genetically Modified Food

Plants resistant to pests (Insects) – No need for pesticides

Drought Resistance
Or larger food production





Golden Rice should help alleviate vitamin deficiencies causing eye diseases and blindness. (added protein)

Companies that make Genetically Modified Organisms (GMO)

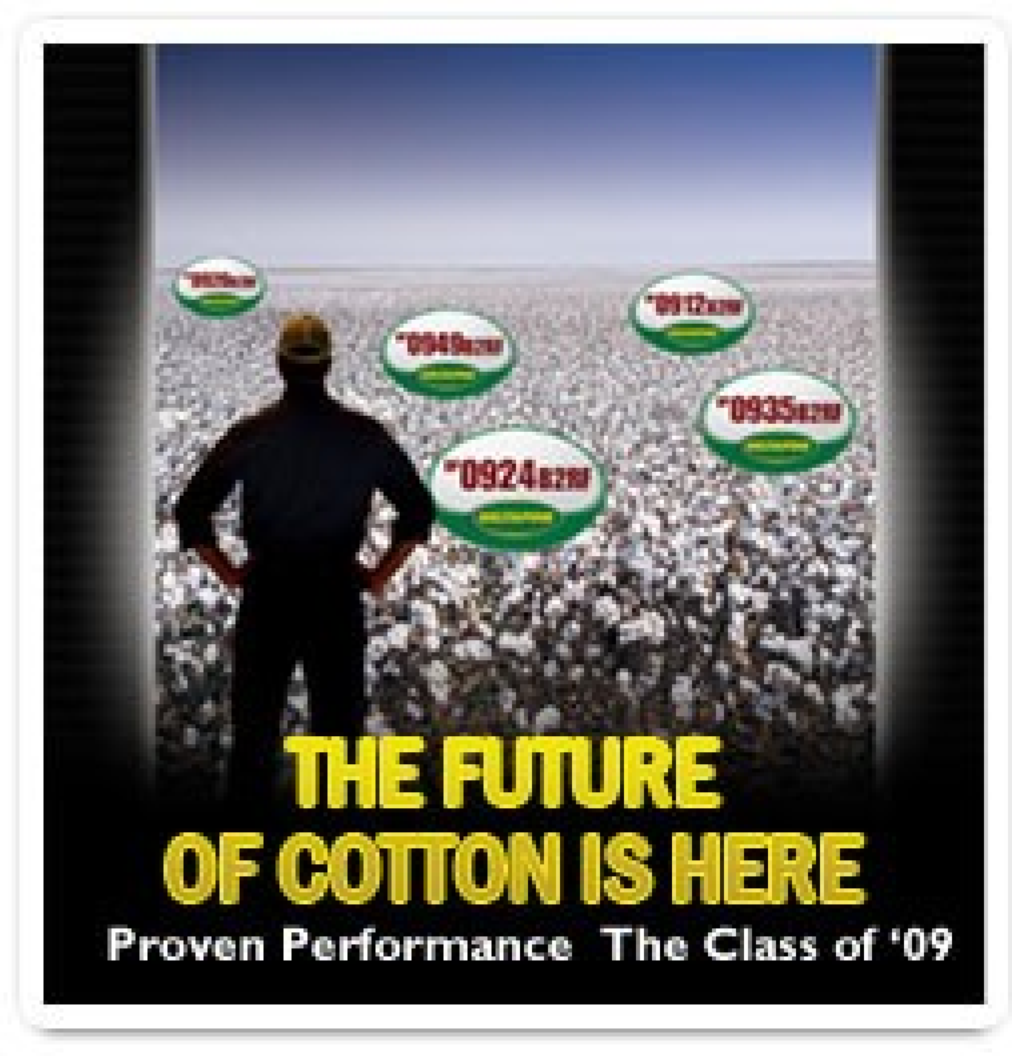
DELTAPINE®

~Better Yield

~Faster Maturity

~Stronger Cotton Fibers

~Less Loss of Crops

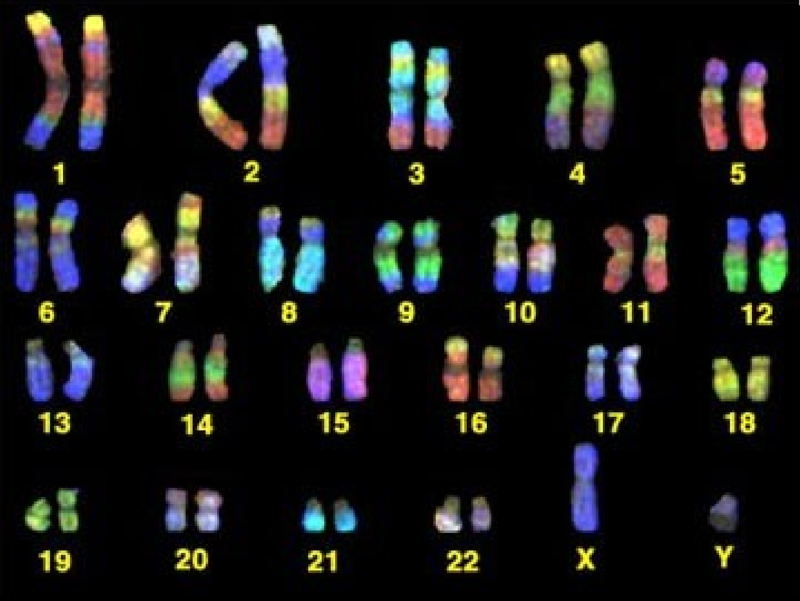

THE FUTURE OF COTTON IS HERE
Proven Performance The Class of '09

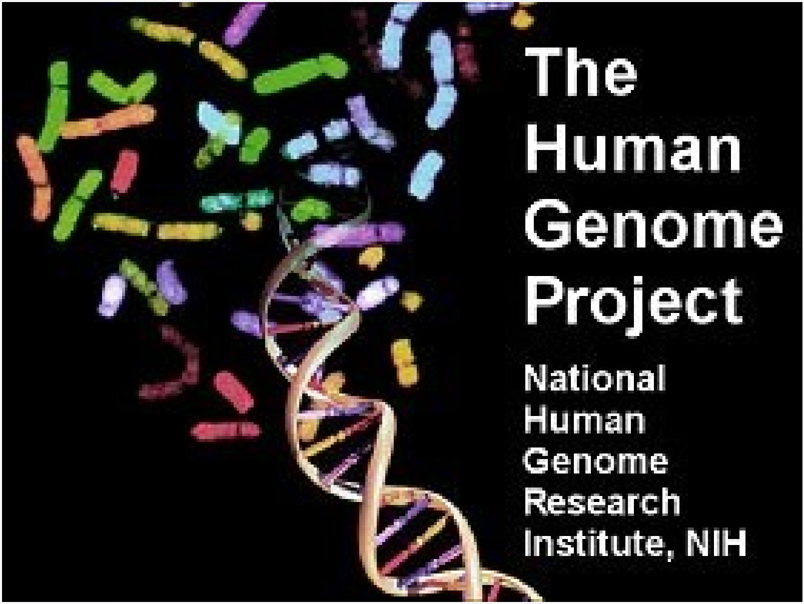
Most Interesting Fact

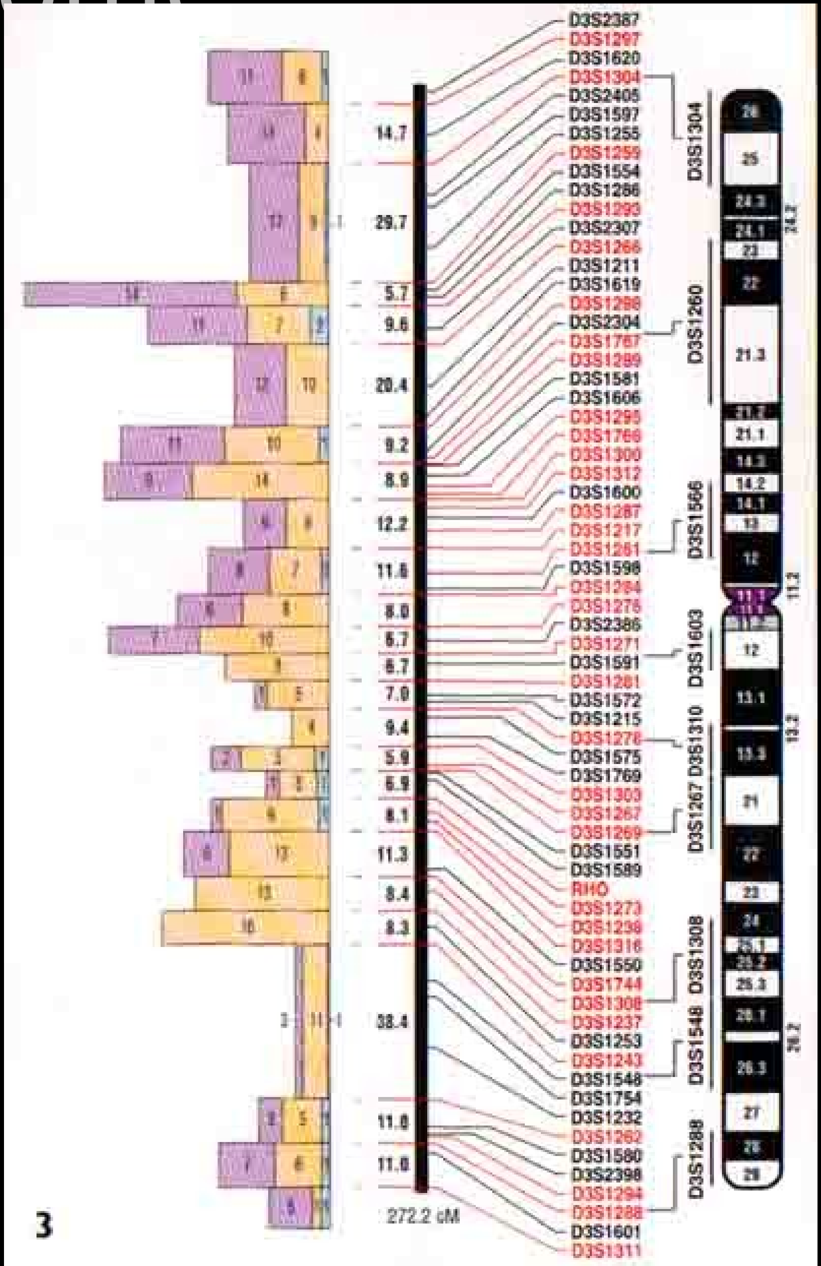
Food	**Properties of the genetically modified variety**	**Modification**	**Percent in US**
Soybeans	Resistant to glyphosate or glufosinate herbicides	Herbicide resistant gene taken from bacteria inserted into soybean	89%
Corn, field	Resistant to glyphosate or glufosinate herbicides, Insect resistance - using Bt proteins some previously used as pesticides in organic crop production.	New genes added/transferred into plant genome.	60%

Cloning

Mapping of the Human Genome

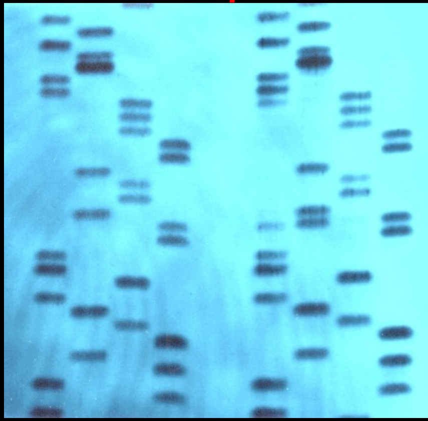



The Human Genome Project
National Human Genome Research Institute, NIH

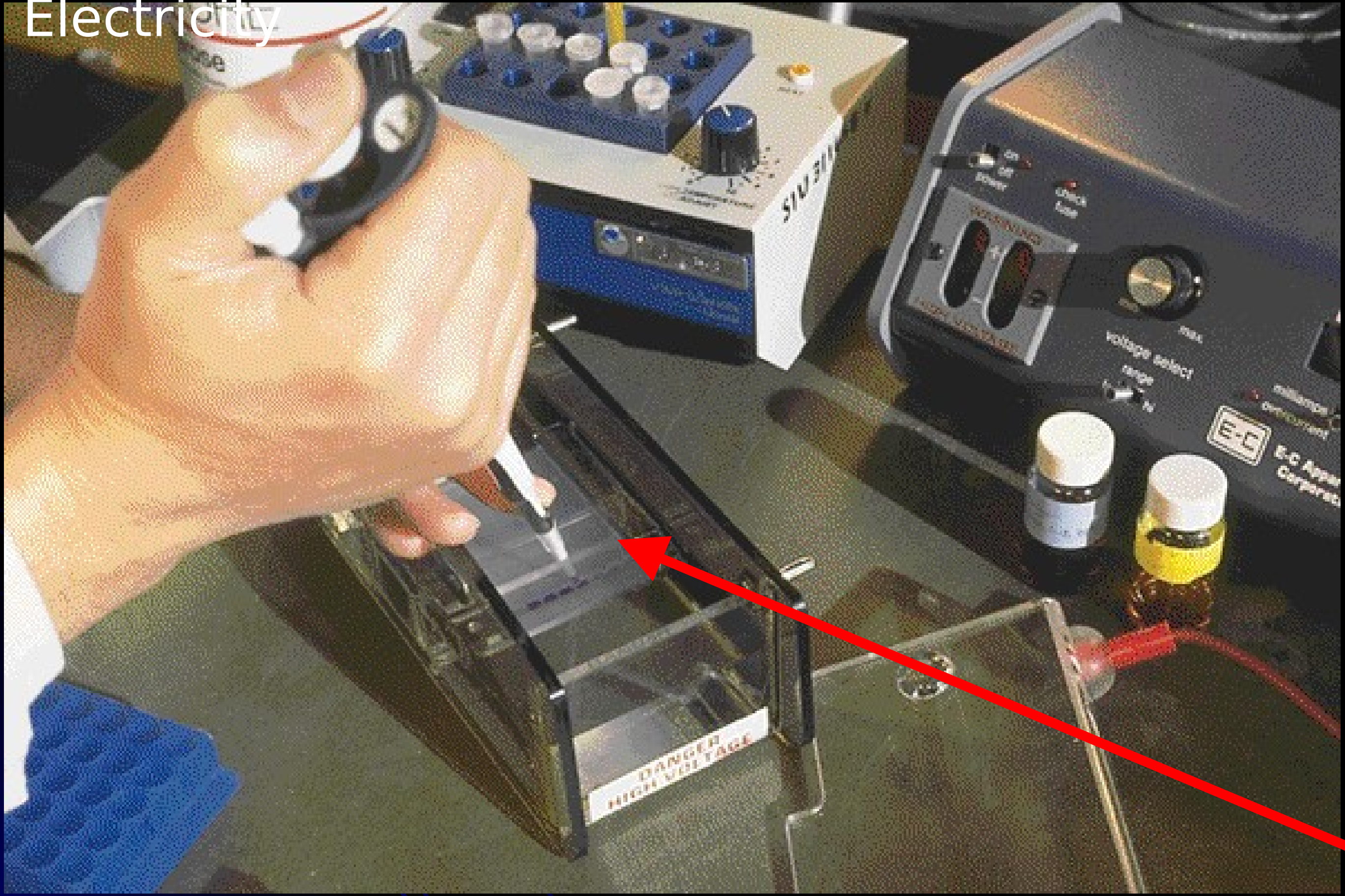


Tools of the Genetic Engineer

Gel Electrophoresi



Separating genes based on their size – using Electricity

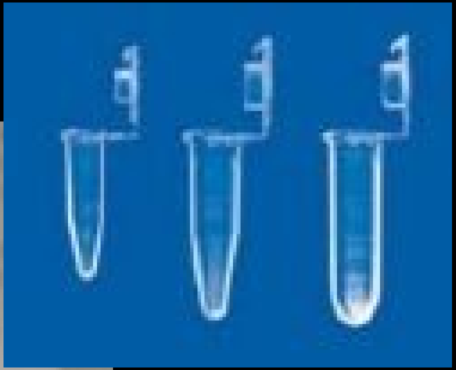


Pipettema n

Need to dye the genes to see them – sometimes they are nast chemicals

Tools of the Genetic Engineer

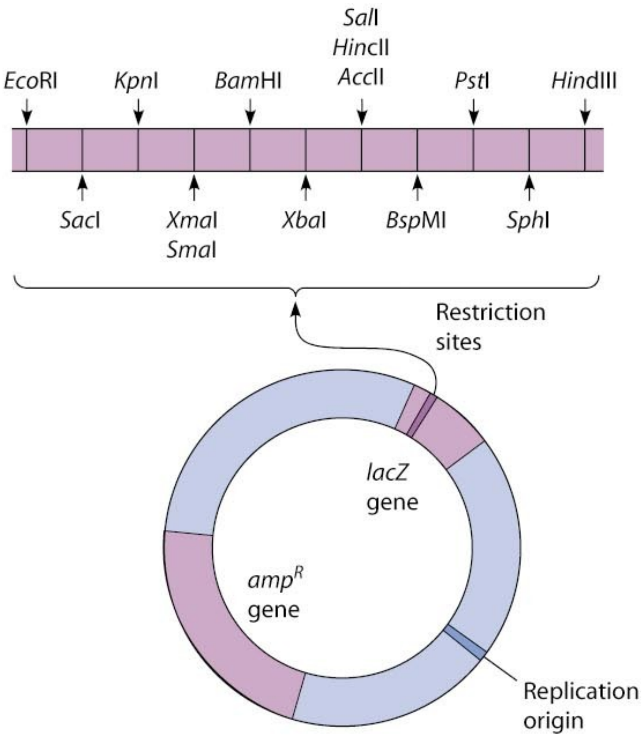
Tiny amounts of material (microliters)



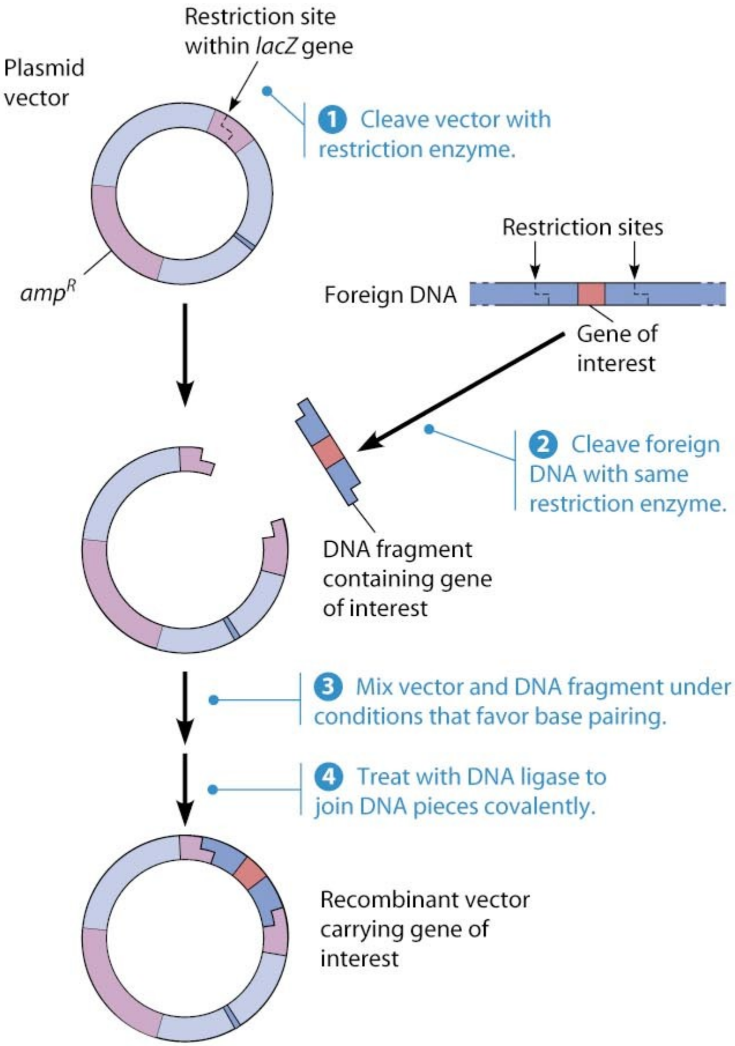
Eppendorf Tubes

Centrifuges (spin wicked fast)

Adding and/or Removing Genes



(a) Plasmid pUC19. The pUC19 plasmid is an *E. coli* plasmid of 2686 base pairs that contains a replication origin, an ampicillin resistance gene (*amp*^{R}), and a *lacZ* gene coding for β-galactosidase. Eleven restriction sites are clustered within the *lacZ* gene.


Restriction site within *lacZ* gene
Plasmid vector
amp^R
Restriction sites
Foreign DNA
Gene of interest
DNA fragment containing gene of interest
Recombinant vector carrying gene of interest

① Cleave vector with restriction enzyme.

② Cleave foreign DNA with same restriction enzyme.

③ Mix vector and DNA fragment under conditions that favor base pairing.

④ Treat with DNA ligase to join DNA pieces covalently.

(b) Procedure for inserting a foreign gene into pUC19.

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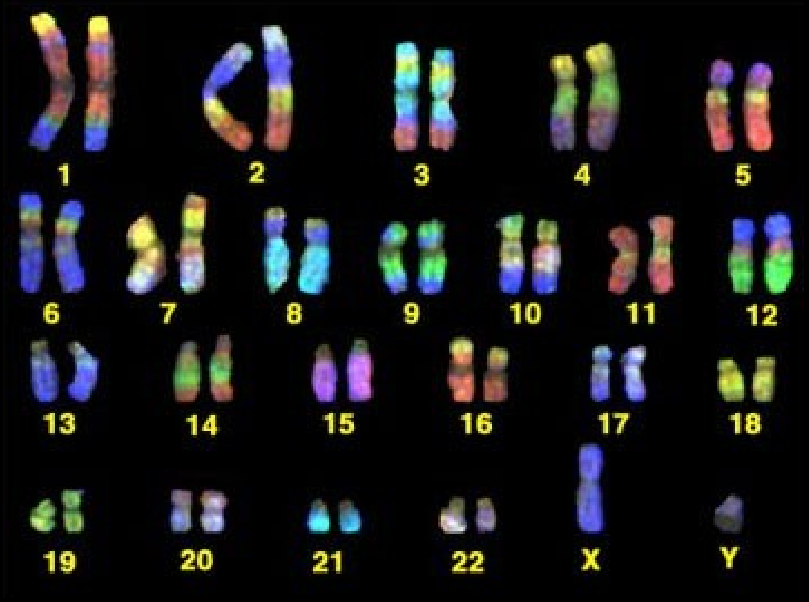
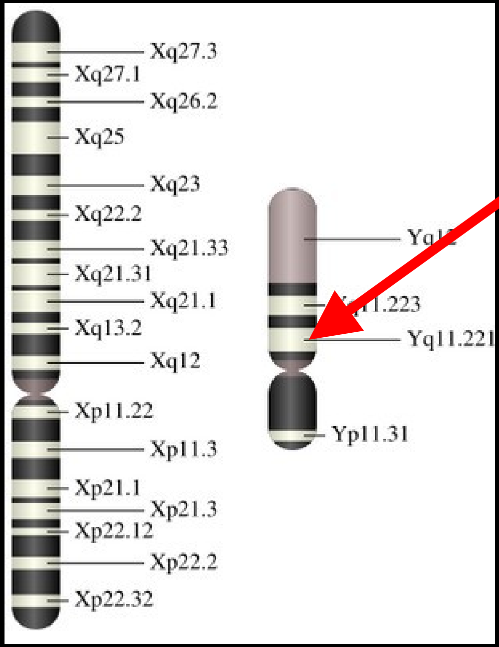
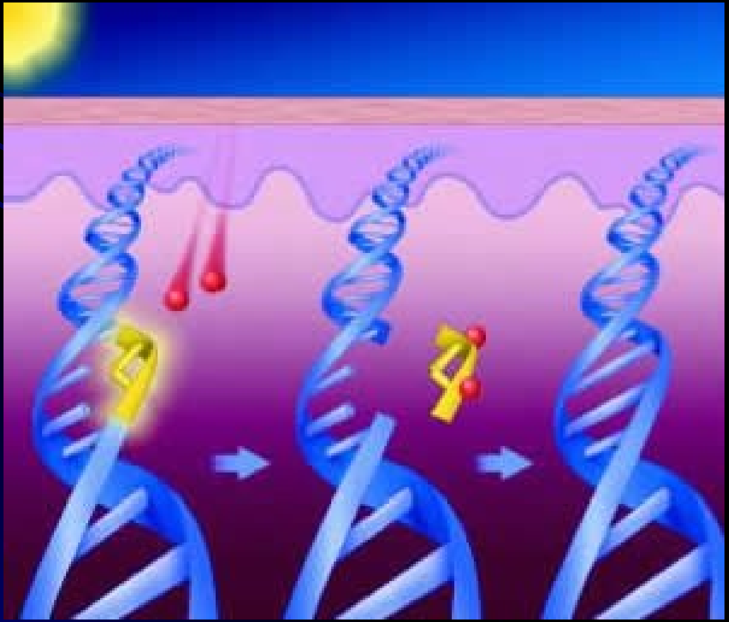
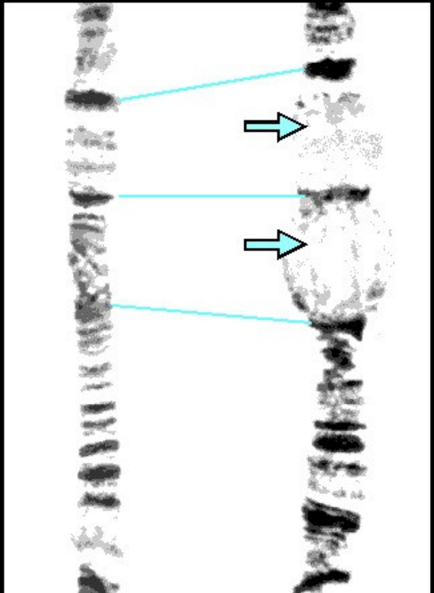
23 Pairs of Chromosomes

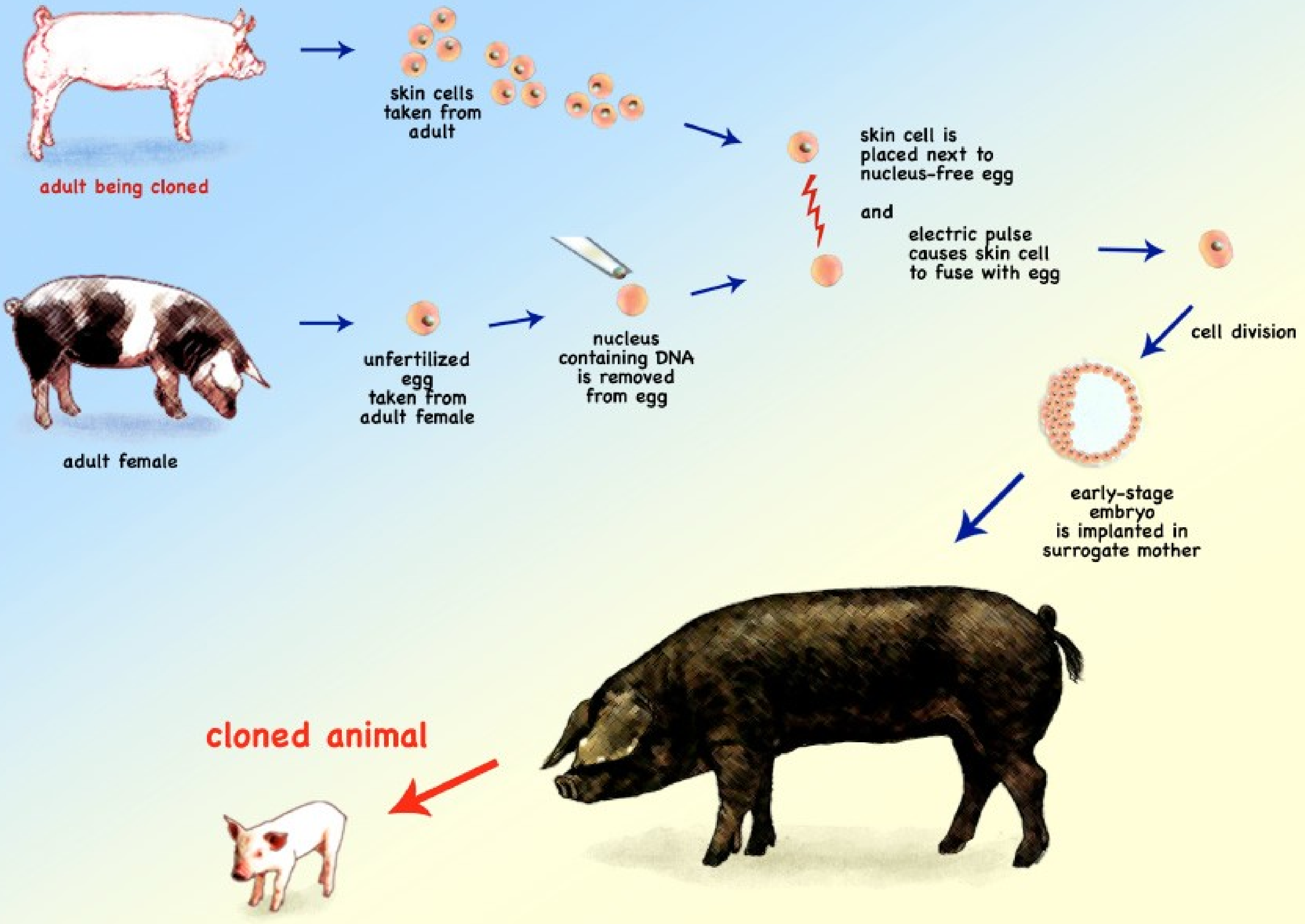




Gene







adult being cloned

skin cells taken from adult

adult female

unfertilized egg taken from adult female

nucleus containing DNA is removed from egg

skin cell is placed next to nucleus-free egg

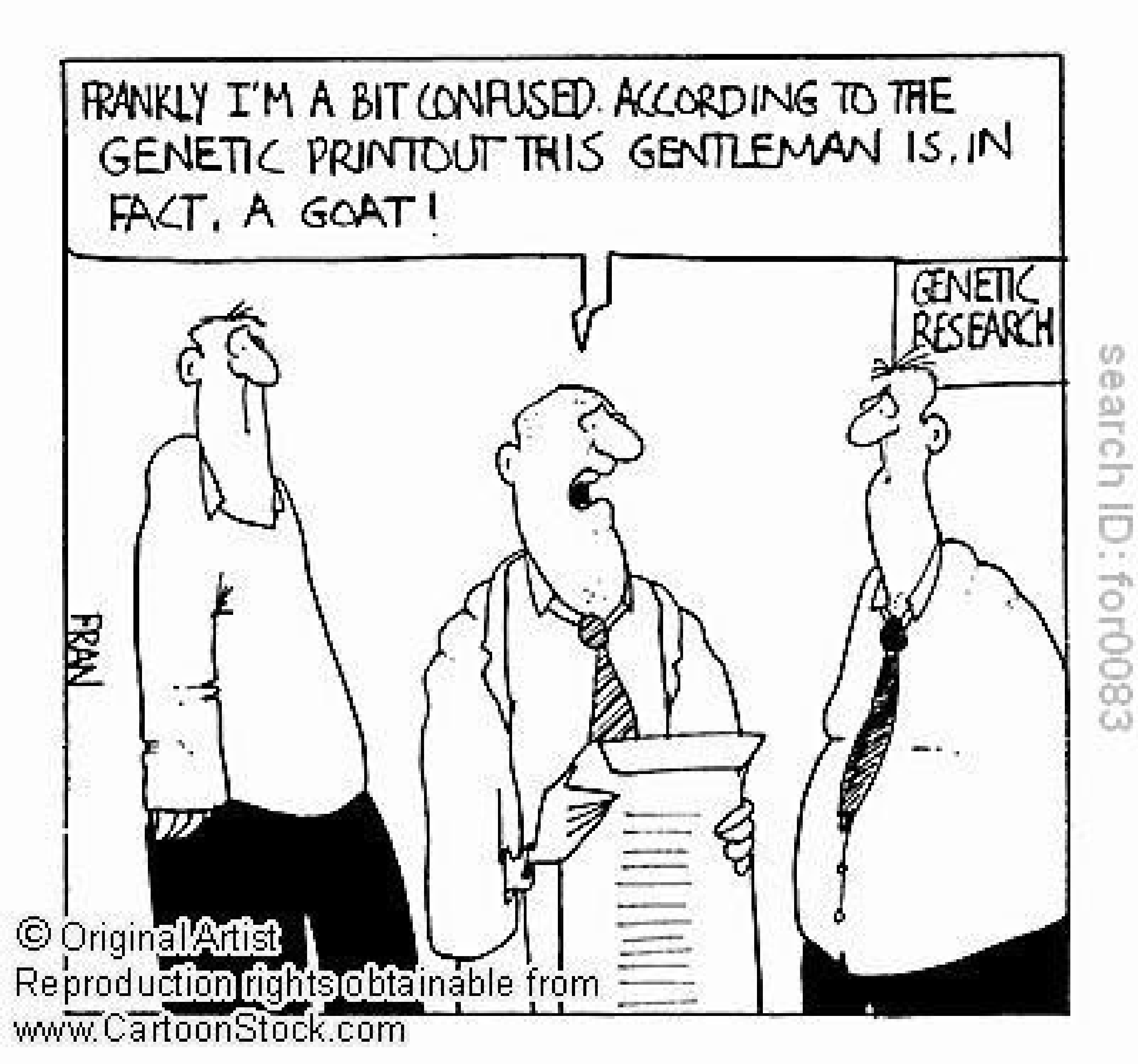
and

electric pulse causes skin cell to fuse with egg

cell division

early-stage embryo is implanted in surrogate mother

cloned animal


FRANKLY I'M A BIT CONFUSED. ACCORDING TO THE GENETIC PRINTOUT THIS GENTLEMAN IS, IN FACT, A GOAT!
GENETIC RESEARCH
FRAN

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